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# The Effectiveness of the Picture Exchange Communication System for Children Who Have Autism

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**The Effectiveness of the Picture Exchange Communication System for Children  
Who Have Autism**

by

Lauren Kaduk

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Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

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## Chapter 1: Introduction

Communication is a critical component of our everyday lives. Communication allows humans to relay and receive information, needs, or thoughts with one another (Ostryn, Wolfe, & Rusch, 2008). It also allows individuals to share values and interests and develop meaningful relationships (Ali, MacFarland, & Umbreit, 2011), along with the ability to express one's preferences (Stoner, Beck, Bock, Hickey, Kosuwan, & Thompson, 2006). When an individual is able to communicate effectively and functionally, they are able to begin making choices and gain independence (American Speech-Language-Hearing Association [ASHA], n.d.). However, when functional communication is hindered, the ability to form relationships, share interests and values, and interact with others becomes greatly limited (Stoner et al., 2006). Many individuals with autism spectrum disorders (ASD) have delays or do not develop speech and language skills to functionally meet their daily needs (Ostryn et al., 2008).

Ali et al. (2011) described functional communication as, “a directed behavior from one person to another who provides a response that could be some form of reinforcement.” Additionally, research indicates that individuals with ASD and other cognitive disabilities can increase communication skills through the use of alternative and augmentative communication (AAC) devices and programs (Ali et al., 2011). One widely used AAC intervention, created by Andrew Bondy and Lori Frost, is the Picture Exchange Communication System (PECS), which uses pictures to convey information and messages (Stoner et al., 2006). The purpose of this paper was to examine the effectiveness of the Picture Exchange Communication System for individuals with autism spectrum disorders.

## **Research Question**

This paper examines one research question. Is the Picture Exchange Communication System (PECS) effective for children with autism spectrum disorders?

## **Background of the Topic**

PECS is a picture-based AAC device (Ganz, Cook, Corbin-Newsome, Bourgeois, & Flores, 2005) created by Andrew Bondy and Lori Frost in 1985 for individuals with autism and similar developmental disabilities (Pyramid Educational Consultants, n.d.). PECS requires the student to exchange a picture representing a preferred item for the physical item (Ganz et al., 2005). Expressive communication skills are focused on throughout the training of PECS by making requests and, later, commenting (Flippin, Reszka, & Watson, 2010). The implementation of PECS is taught through six phases (Ganz et al., 2005) requiring each phase to be mastered before moving onto the next phase due to an increase in complexity between each phase (Ganz, Simpson, & Lund, 2012).

The first phase of PECS is the initial communication training or picture exchange, where the student is taught to hand a picture to the trainer in exchange for a desired item (Flippin et al., 2010). Physical prompts can be used with a second trainer and are quickly faded (Ganz et al., 2005). The second phase is the distance phase which requires the student to retrieve a picture from their communication book and deliver it to the trainer or communicative partner (Ganz et al., 2012). This phase also focuses on generalization among communicative partners' distances (Ganz et al., 2005), contexts, and reinforcers. The third phase focuses on picture discrimination by using highly desired items along with non-desired items to ensure that the

student is actually requesting the preferred item (Flippin et al., 2010). During Phase 4, sentence structure or phrases are taught by using an “I want” phrase followed by the desired item (Ganz et al., 2012), requiring the student to use two picture representations (Flippin et al., 2010). Phase 5, the answering questions phase, expands on previously taught skills by teaching the student to respond to questions, such as “What do you want?” (Ganz et al., 2005). The final phase of PECS is the commenting phase, where the student is taught to expand their use of sentence strips by using phrases, such as “I hear,” “I see,” “I feel,” etc. (Ganz et al., 2012) to answer questions from the communicative partner. Once all six phases of PECS are implemented, additional training can be taught to expand the use of verbs, numbers, yes/no answers, etc. (Flippin et al., 2010).

**Table 1**

**Outline of PECS**

PECS PHASE	SKILLS TAUGHT
1: Initial picture exchange	The student is trained to hand a picture to the trainer in exchange for a desired item.
2: Distance phase and generalization	The student is required to retrieve a picture from their communication book and deliver it to the communicative partner.
3: Picture discrimination	Highly desired items are used in conjunction with non-desired items.
4: Sentence structure	The phrase “I want”, followed by the desired item is used to begin teaching sentence structure.
5: Answering questions	Previously taught skills are used to answer questions from the communicative partner.
6: Commenting phase	The use of sentence strips is expanded by adding additional phrases, such as “I hear,” “I feel,” “I see,” etc.

**Focus of the Review**

I identified 11 studies conducted between the years 1998 and 2014. The studies based their research on participants ranging from 1½ years old to 14 years old. The majority of

participants were individuals who had a diagnosis of autism. Some of the participants had developmental disabilities. All of the participants were either non-verbal or had very little communication skills. If they had communication skills, their skills were not functional. All of the studies were conducted within the United States, except for one study which was conducted in Italy.

I located my research by using the JSTOR, ProQuest, and EBSCO databases. To locate related information to my topic and to narrow down my research, I used a variety of keywords and combinations of keywords including: *Picture Exchange Communication System, effectiveness, benefits, long-term, autism, autism spectrum disorders, communication.*

### **Importance of the Topic**

With my background in communication sciences and disorders (CSD), I have always found communication to be crucial for building and maintaining relationships with others. When there are communication deficits, individuals can experience negative effects in other areas of development, especially for individuals with ASD (Schwartz, Grafinkle, & Bauer, 1998). Such deficits can lead to internalizing behaviors (e.g., anxiety and depression) and externalizing behaviors (e.g., attention problems and aggression) (Lerna, Esposito, Conson, & Massagli, 2014).

I believe that it is important for everyone to have a mode of communication to effectively and appropriately communicate their wants and needs. In my experience working in a group home, I found that by providing my clients with a way to communicate what they were feeling or needed, their behaviors decreased drastically. To provide each student in my classroom a way to



communicate effectively, I need to ensure that I am implementing effective, evidence-based interventions.

### **Definition of Key Terms**

*Alternative and Augmentative Communication (AAC)* refers to all forms of communication (other than oral speech) used to express thoughts, needs, wants, and ideas (ASHA, n.d.).

*Autism spectrum disorder (ASD)* is a developmental disability that can cause challenges with social-emotional interactions, communication, and behavior. Individuals may engage in repetitive behaviors and react inappropriately to change (Center for Disease Controls, 2016).

*Functional communication* is the way in which individuals communicate and express wants, needs, feelings, and preferences to others effectively without a communication breakdown (ASHA, n.d.).

*Picture Exchange Communication System (PECS)* is an augmentative communication system used to increase functional skills (Tien, 2008) by using pictures of items to obtain tangibles and needs (Ostry et al., 2008). PECS is procedural and involves a six-step process, which is designed for early communication training (Sulzer-Azaroff, Hoffman, Horton, Bondy, & Frost, 2009).

## Chapter 2: Review of the Literature

The purpose of this paper was to examine the effectiveness of the picture exchange communication system (PECS) for children who have autism. For this chapter, I reviewed 11 studies that implemented PECS to individuals with autism and developmental cognitive disabilities to determine the effectiveness of the intervention.

### PECS Studies

Adams-Hill and Flores (2014) conducted a single-subject alternating treatment study to determine whether using a low-tech (PECS) or technology based communication system (iPad) was more effective to promote independent use of the system provided. Five students participated in this study, ages 3-9 years old. Three of the students had autism and two of the students had a developmental delay. The participants were enrolled in an extended school year and were chosen based on their need to develop functional communication skills.

Prior to intervention, the researchers created communication sentence strips and books to be used as part of the intervention. The pictures used in the PECS intervention were the same pictures represented on the iPad app, *Proloquo2Go*, to ensure students were exposed to the same symbols. Baseline data were collected to determine each student's beginning level for PECS. During the initial assessment, each student was presented with a picture of a snack. The student was required to pick up the picture and give it to the teacher. If the student did not make an attempt to pick up and exchange the picture, the physical prompter guided the student. When the student was able to independently exchange the picture for ten trials with 90% accuracy, the student moved onto the next phase of PECS. Two students remained at Phase 1 and three moved

through Phases 1-4. The same procedures were used when implementing the iPad intervention. Depending on the student's ability, one to seven pictures were represented on each page on the iPad.

Once a baseline was established, the intervention took place. Students in the first phase of PECS had a teacher sit behind them and physically prompt the student to pick-up the picture and reach toward the communication partner, and then let go of the picture. Once the student mastered the phase with at least 90% accuracy, they would move onto the next phase of PECS. The same procedures were used for the iPad intervention, except for during Phase 1, the prompter guided the student from behind to touch the icon on the iPad.

Event recording was used to collect data throughout the two interventions. During Phase 1 of PECS, the three following steps had to be completed to be considered as an independent request: picking up the picture, reaching toward the teacher with the picture, and letting go of the picture into the teacher's hand. During Phase 1 of the iPad, the student was required to: touch the icon and release their finger to generate speech. Inter-observer reliability was collected for approximately 40% of the sessions and was calculated by using the number of agreements divided by the sum of agreements and disagreements. Inter-observer reliability was over 90% for all sessions.

Results indicated that each student responded differently to each communication intervention. Sondra demonstrated more independent initiations and requests using pictures, whereas Kent showed more requesting behaviors when using the iPad. Art and Jackie began to demonstrate more independent requests using the iPad toward the end of the study. Both Kent and Olive indicated a preference for the iPad, but began to say words aloud when using PECS.

Overall, it was indicated that PECS may be preferred in the early stages of communication, and implementation of the iPad could be beneficial once the student has a communication repertoire. PECS would require transporting and handling a variety of cards, whereas the iPad is more compact and easier to transport. PECS also promoted spontaneous speech, whereas the iPad has generated speech when the icon is pressed allowing the iPad to speak for the student, rather than the student producing their own speech.

Ali et al. (2011) conducted a multiple probe baseline study to determine if adding tangible items to PECS would increase requesting behavior in students who had visual impairments. The study was conducted at a K-12 school that provides services to children with visual impairments. The participants were between 7 to 14 years old with a visual impairment. Three of the participants had autism and one had a moderate cognitive disability.

The study began by determining three to six reinforcing items for each student and one non-preferred item. Once reinforcing items were determined, a baseline was established by presenting the participant with a tangible symbol or pictures paired with the tangible symbol. Then, a method of enticement was used due to the visual limitations of the participants. This included: (a) the participant touching the preferred item, (b) moving the item close to the participant, (c) presenting the item with a noise, or (d) allowing the participant to smell the item.

During the training phase of the study, the first three phases of PECS were implemented. In Phase 1, the participant was to pick up the tangible symbol, reach toward the communicative partner, and release the symbol into the partner's hand. In Phase 2, the same method was used as in Phase 1; however, the symbol was gradually moved away from the participant to teach the participant to continue communicating with others even when not within arm's reach. In Phase

3, the participant was to choose the correct tangible symbol representing the preferred item from two symbols.

Once each participant mastered all three phases, they began generalization sessions into the classroom. There were no physical or verbal prompts provided to the participants and no error correction procedures were provided. Maintenance sessions were then implemented once the participant met the criterion of Phase 3.

Results indicated that all four students learned how to make requests for preferred items. They were able to generalize their skills to a natural setting and maintain those skills after training ended. Due to the visual impairments of each student, Phase 3 was the most challenging for the participants. This phase required the participants to differentiate between two tangible items.

The author indicated that PECS is mainly used to teach spontaneous and functional communication and the participants in this study used PECS to learn requesting skills. They suggested that PECS be implemented with other communication systems to achieve the most effective communication.

Dogoe, Banda, and Lock (2010) conducted an experiment to determine the effects of PECS by using a single-subject multiple baselines across participants design. The participants included three preschoolers ages 3 to 5 years old. All participants in this study had autism and little to no functional communication skills. Sessions were conducted at the university-based autism center, home, and community settings.

Two behaviors, requesting and generalization, were used in this study to measure the effects of PECS. Each participant's preferred item/s were identified through a preference assessment as snack items, small toys, and playground equipment. Pictures of these items were created to represent each item. A baseline was established for each participant to determine their level of requesting skills and ensure they did not have the communication skills used with PECS.

The intervention included the mastery of the first three phases of PECS. In Phase 1, the participant was to pick up the picture, reach toward the communication partner, and release the picture into the partner's hand. A physical prompter was used during this phase to guide the participant's hand toward the communication partner. Phase 2 used the same criterion as Phase 1, except the participant was required to travel to the communication book, obtain the trainer's attention, and release the picture into the communication partner's hand. Phase 3 consisted of two stages, Phase A and Phase B. In Phase IIIA, the participant had to learn how to discriminate between preferred and non-preferred items, and in Phase IIIB the participant had to learn how to discriminate between only preferred items.

Once Phase IIIB was mastered, generalization probes were conducted. There were three generalization probes conducted in this study: across persons, across settings, and across stimulus classes. During the generalization phase across persons, each participant had a different communication partner that they were familiar with. Two of the participants had a sibling as the communication partner and one of the participants had a family friend and neighbor as their communication partner. A variety of settings were also used during the generalization across settings phase, these included the hallway of an elementary school, a park, and within the home of one of the participants. The playground was used for all three participants as an additional

stimulus class. The items represented were larger items such as, the slide, swing, see-saw, etc. The reinforcer for this phase was not delivered immediately due to needing to move to each object since it is larger.

All three participants demonstrated acquisition and generalization of PECS. Each participant's baseline data indicated no correct responses. For acquisition for skills, by the end of Phase IIIB all participants had 100% correct responding. One participant ended training with an array of eight pictures. Another participant ended training with an array of six pictures, and the last participant had an array of three pictures. One participant was able to reach 100% correct responses across all generalization probes. The second participant reached 88% across persons, 95% across settings, and 100% across stimulus classes. The last participant was able to reach 100% across settings and persons, but failed (43%) for the skills across stimulus classes.

The researchers also conducted a social validity questionnaire, which indicated that one parent thought that PECS was *very effective* and the other parent found it to be just *effective*. Both parents indicated that they thought PECS is not costly to implement and that they do not find any disadvantages with the program. They also found that PECS fit into their family routine well and that it was easy to implement within the home.

Ganz et al. (2005) conducted a single case study to determine if PECS would increase a participant's communication skills. The researchers used one 5-year-old girl with severe autism. She had no recognizable speech and had been exposed to sign language. Sessions were conducted in the participant's home.

To begin the study, the researchers conducted an assessment to determine the participant's preferences. The participant's mother provided a list of foods and toys the

participants likes. The researchers determined the participant's five most preferred items by placing them on the table and tallying which items the participant chose the most. Upon determining reinforcing items, the researchers established a baseline of the participant's skills.

Training of PECS included four phases. During the first phase of PECS, the participant was not making progress, so the researchers broke this phase into two parts, Phase 1A and Phase 1B. Phase 1A required the participant to touch a clear box containing the preferred item. Once the participant touched the box, the trainer provided her with the item and verbally labeled it. During phase 1B, the procedures were the same as Phase 1A, except a picture was attached to the box, which required the participant to pick up the box. The researchers then chose to implement a variation of Phase 3. This phase was also broken up into two parts, Phase 3M and 3B, to teach the participant to discriminate between two items. During Phase 3M, two boxes were presented to the participant, one preferred item and one non-preferred item. When the participant picked up a box with a preferred item, she was given the item. During Phase 3B, the same procedures were used as Phase 3M, except the boxes were removed and only pictures were used.

Results indicated that the participant performed no more than 20% of the trials during Phase 1 of PECS independently, therefore, this led to Phase 1 being broken down into smaller subsections (Phase 1A and Phase 1B). During Phase 1A, the participant performed independently for 80% or more of the trials. She also met the 80% criterion for Phase 1B. During Phase 3M, the participant met the 80% criterion within six sessions and within four sessions during Phase 3B.



The researchers concluded that students with ASD require a multifaceted approach for designing an effective communication system. The participant in this study would not have been provided an effective means for communication had the researchers not introduced additional phases into the PECS training. By adding additional phases, the participant was able to learn how to use PECS more gradually than the traditional protocol. Overall, the participant was able to gain skills to communicate her desires. Additional training would need to be implemented for her to gain spontaneous, independent skills for communicating. The researchers suggested the next steps would be for the participant to generalize the skills she learned into other environments.

Ganz et al. (2012) conducted a single case study using a 5-year-old girl who has autism to determine the effectiveness of PECS. The participant had complex communication needs and did not speak. Sign language was attempted in the past, but she had difficulties imitating many of the signs. It was determined that she would be a good candidate for PECS. The participant was able to master all six phases of PECS training.

During the first phase of PECS, the participant began to independently pick up and exchange icons after seven trials. Once she reached 90% accuracy over ten trials in one day in three settings (i.e., classroom, cafeteria, home), she moved onto Phase 2 of PECS. To begin Phase 2, the participant was provided with only one picture on her communication board. She was to retrieve the picture and bring it to the communication partner on the opposite side of the room. Once she achieved 90% accuracy across 10 trials, the communication partner moved farther away to an adjacent room, requiring the participant to travel farther. Throughout the phase, more icons were added to her communication board. During Phase 3, a non-preferred

item was added to the communication board to teach discrimination. At first, she cried when she chose the non-preferred item (blocks) and was given blocks as a reinforcer. By the end of Phase 3, she was able to discriminate between and select up to seven pictures.

To advance the participant's skills, sentence strips were added during Phases 4 and 5. She was provided with the "I WANT" picture and was required to combine it with a preferred item from her communication book. When she presented the two pictures to the communication partner, the partner read the sentence strip aloud. Once the participant mastered Phases 4 and 5, she moved onto Phase 6, which was initially more difficult for her. Phase 6 required the participant to use additional sentence strips containing the phrases "I SEE," "I HEAR," and "I HAVE." The participant began to comment spontaneously during Phase 6. A new sentence strip was introduced once the participant mastered the previous strip with 90% correct responses.

The researchers concluded that the implementation of PECS was beneficial for this participant. She was able to master all six phases of PECS and generalize her skills across multiple settings. They indicated that the participant displayed many challenging behaviors prior to the implementation of PECS, and following training she was able to request a "break" in noisy or crowded environments, thus decreasing her challenging behaviors. PECS provided the participant a more socially acceptable way to communicate her wants and needs.

Kravitz, Kamps, Kremmerer, and Potucek (2002) conducted a multiple baseline design across settings study to determine the effects of PECS on spontaneous communication skills and social interaction. The participant was a 6-year-old girl, named Molly, with autism and had very little functional communication skills. She produces one to two word utterances, which were

difficult to understand. She also had very little interactions with others and used many gestures to communicate.

To begin their research, a baseline of Molly's spontaneous language and social interactions was established across 4 weeks in multiple settings (i.e., home, centers, and journal time). An additional baseline was established for Molly's use of a communication board with symbols. Molly was not prompted to use the communication board. Once a baseline data was established PECS training began, which included the first three phases of PECS.

During the first phase of PECS, Molly was physically prompted to pick up the picture and hand it to the trainer (communication partner). When she let go of the picture into the trainer's hand, the trainer said "Oh, you want \_\_\_\_," and provided the item to Molly. When Molly made 80% of the requests independently, training moved onto Phase 2 of PECS. The second phase of training consisted of three steps: introduction of the communication board, increased distance of the trainer and Molly, and an increased distance of the communication board from Molly. Phase 3 introduced multiple pictures to teach discrimination between pictures and the picture size was reduced to fit more pictures on her communication board. The same criterion of 80% was used across all phases. The first three phases were initially taught within the participant's home, and then implemented into the classroom.

To increase Molly's social interactions, PECS was used along with social skills training to increase the duration of her interaction with peers. Prior to training, her peers were taught how to keep Molly engaged during game playing situations. Training included defining the skill, modeling, and practicing the skill.

Results indicated that Molly successfully used PECS and the effects were consistent across home and school when used by her mother, teachers, and peers. It was noted that an increase in initiations at home occurred when reinforcers from training were available during free play to increase spontaneity. Molly increased her intelligible verbalizations in two of the three settings from 15-16 at home and 5-8 at school. She also increased her initiations at home from 8-9 to 18 during play and at school from 3-5 to 14. Her duration of social interactions with peers only increased in one of the settings from 26-60 seconds to 146 seconds during journal time.

The researchers concluded that PECS was effective in increasing spontaneous communication skills for a young child with autism. The participant demonstrated an increase in intelligible verbalizations and increased peer social interaction. Prior to PECS she mainly interacted with adults and used mostly nonverbal communication (i.e., gestures and smiles).

Lerna, Esposito, Conson, Russo, and Massagli (2012) conducted a quantitative study to determine the effects of PECS on social-communicative skills in children with autism. The participants in their study included 18 preschool children ages 18 months to 5 years old. All participants had little or no functional communication skills and had a diagnosis of autism. The participants were split into two groups. One group received PECS training and the other group received Conventional Language Therapy (CLT).

CLT is a technique that uses prompts and reinforcements through a systematic, step-by-step system. To increase receptive language skills, children are taught to attend to a communicative partner and respond to simple instructions. Association learning is used to increase expressive language skills. Training for receptive and expressive language skills are

taught by presenting a child with a preferred item. When the child shows that they want the item by reaching for it, the therapist waits to provide the child to say the word independently. If the child does not say the word, the repeats the name of the item three times. Once the child says the name of the item, they receive the item.

To begin their research, Lerna et al. (2012) administered four pre-treatment assessments to determine this participant's baseline. The pre-treatment assessments included *Griffiths' Mental Developmental Scales (GMDS)*, *Autism Diagnostic Observation Scale (ADOS)*, *Vineland Adaptive Behavior Scales, Second Edition (VABS-II)*, and *unstructured free-play with examiner*. The *GMDS* is used to assess receptive and expressive language and proficiency in the activities of daily living. The *ADOS* is used to assess communication and reciprocal social interactions. The *VABS-II* is a parent report of the participant's communication and social abilities in other settings (i.e., home and community). Unstructured free-play allows the examiner to assess specific variables (i.e., cooperative play, eye contact, joint attention, requests, and initiation).

Upon establishing a baseline, speech-language pathologists began therapy for 30 minutes 3 times a week for 6 months (72 sessions total) within a psycho-education rehabilitation program. It was indicated that the speech-language pathologists had expertise with children with autism. The PECS group received training on Phases 1-4. Prior to the implementation of PECS, each participant's preferred food and toys were indicated for reinforcement use. Pictures of each participant's favorite food and toys were placed onto a card. Each participant had to achieve 80% independent correct exchanges for three consecutive sessions before they were able to move onto the next phase of PECS. It took an average of 6.3 sessions for each participant to meet the criterion for moving onto the next phase.

When comparing the two groups, PECS and CLT, the *VABS-II* indicated that the PECS group showed a significant improvement on the Communication and Social domains, but not the other areas. They also showed significant improvements on all social-communicative abilities in an unstructured setting. As for the CLT group, it was indicated that there was no significant difference on any of the measures used in this study. The researchers concluded that there was not a difference between the two groups during baseline assessments, whereas the post-testing indicated that the PECS group showed significant improvements. It was indicated that PECS can improve social-communicative skills for children with autism.

Lerna et al. (2014) conducted a quantitative study to determine the long-term effects of PECS by assessing social-communicative skills in nonverbal children after 12 months from implementation of PECS. The participants included in this study were 14 preschool-aged children with autism. The participants were split into two groups, one group of seven who received PECS training, and the other group of seven received CLT, to determine how effective PECS is for nonverbal children.

Initial treatment of PECS and CLT were implemented within a psycho-education rehabilitation program based on the Treatment and Education of Autistic and Communication related handicapped CHildren (TEACCH) model. To increase generalization skills, increase motivation skills, and develop social skills, a semi-structured setting was implemented.

Throughout PECS training, Phases 1-4 were implemented.

Throughout their research, the participants were assessed a total of three times. They were assessed at baseline (pre-treatment), after 6 months of PECS training (post-treatment), and 1 year after treatment completion (follow-up). Four outcome measures were used to assess the

participant's social-communicative abilities including: *GMDS*, *ADOS*, *VABS-II*, and *unstructured free-play with examiner*.

Results of the outcome measures at the time of follow-up indicated that the participants scored lower *ADOS* severity scores in the PECS group than in the CLT group. The PECS group also scored higher on *GMDS* and *VABS-II*. The *VABS-II* showed that the PECS group retained the skills they learned through PECS training one year after treatment ended. Social-communicative skills during free-play showed a significant increase in the frequency of joint attention and initiation in the PECS group compared to the CLT group. In the PECS group, cooperative play and verbal requests also continued to improve during the follow-up study. The importance of early socio-communicative skills training is important for initiation and cooperative play toward the development of speech.

It was indicated, by the researchers, that PECS training can promote long-term effects on socio-communicative skills for children with autism. They concluded that PECS was more beneficial for individuals with little to no functional communication skills who had autism than using conventional language training strategies. It was noted that verbalizations among participants in both groups did not increase from post-treatment to the follow-up study.

Schwartz et al. (1998) conducted two studies to determine how long it takes children to acquire PECS and the generalization of PECS to various settings. The first study included 31 children, 16 children with autism and 15 with developmental disabilities. The participants' ages ranged from 3 to 6 years old. All participants had severe social, communication, and cognitive delays. The second study consisted of 18 children from the first study. Interventions were implemented within a preschool classroom at an early childhood center.

The first study began by collecting data based on the 31 children who had used PECS over the past 4 years. The researchers used the participant's IEP information to determine how long it took each participant to acquire each phase of PECS. They were able to determine how many weeks it took each participant to learn each phase of PECS based on their educational records.

Once the participants mastered exchanging pictures for the item, discriminating between multiple pictures, and sentence building for requesting, they began to learn how to use PECS with peers. To promote peer interactions, when a participant requested an item the teacher prompted the participant to ask a peer by saying, "I don't have (item requested). Ask (peer's name)." If the participant did not respond to the teacher's verbal prompt, the teacher would provide a physical prompt by guiding the participant's hand, holding the symbol, to the peer.

Results of the first study indicated that it took an average of 14 months (3-28 months) for the participants to functionally use PECS to communicate with adults and peers. The participants acquired the skills to exchange a picture for an item within an average of 2 months (range=1-5 months). It took an average of two months (range=1-6 months) to master distance and persistence phases of PECS, and an average of an additional 3 months (range=1-6 months) to complete discrimination phases. Then, sentence building phases began, which took an average of 4 months (range=1-9 months) to master. Additionally, an average of 3 months (range=1-12 months) to master the use of PECS with peers. The researchers indicated that each participant was able to gain functional communication skills through the use of PECS.

The second study was conducted to determine the generalization of PECS and the production of spontaneous speech after one year of implementation. Each participant in the



study was part of the first study. The participants in the second study were required to remain enrolled in the preschool program during the time that data collection began and throughout the 12 months that the study lasted.

The study took place within integrated preschool classrooms. The researchers chose to collect data during snack and free-choice activities since these environments offer a variety of arrangements and demands. The classroom teachers ensured that each participant had their PECS communication books available during snack and free-choice. During snack the classroom staff made PECS a high-priority time for training. The participants were required to make requests during snack time, whereas during free-choice they were encouraged to make choices without asking or adult assistance.

Data were collected using live observations during snack time and free-choice activities to determine the participant's growth in overall communication. Snack time allowed the researchers to assess the participant's communication skills during teacher-directed activities. Free-choice provided the researchers with data during child-directed activities. The researchers collected data for the duration of the activity or until 50 utterances were made by the target participant.

Language samples were used to collect data. Each participant was observed three times over the 12-month study. The observers recorded utterances verbatim and gestures or signs whenever the participant used them. Each form of communication was coded as: gestures, vocalizations, manual signs, PECS exchanges, and verbal. Gestures included body movements such as facial expressions (smiling or frowning), eye contact, pointing, shrugging, pushing, etc. Vocalizations included any sounds that the participant made such as laughing, crying, screaming,

etc. Manual signs were identified as when the participant made consistent gestures that produced meaning or was understood by the communicative partner. PECS exchanges were recorded when the participant handed their picture symbol to the communicative partner. Verbal was identified as any time the participant said words, which were defined as, “phonetically consistent forms produced by the target child and understood by the communicative partner as having specific meaning (e.g., “kaka” was accepted for cracker).”

Upon identifying each form of communication, the researchers also coded each function of behavior as: requests, comments, protests, responses, or no communicative intent. Requests were described as when the participant initiated engagement with a communicative partner and was persistent in communicating with the partner until they responded. Comments were defined as when the participant moved the communicative partner’s attention toward another person, object, or action. Protests were defined as when the participant declined a request made by the communicative partner. Responses included any time the participant made an utterance or a vocal reaction to the communicative partner. No communicative intent was recorded as when the participant did not engage with the communicative partner.

When comparing data, to determine whether or not the participants were able to acquire spontaneous speech through the use of PECS, the researchers split their data into two groups, talkers and non-talkers. Talkers were identified as those who spoke five or more words in the first free-choice observation. Non-talkers were identified as those who spoke fewer than five words in the free-choice observation. New words were only counted when the participant uttered the word for the first time, thus if they repeated the word or said it a second time, the word was not recorded.

During free-choice time, results indicated that, for the talkers, the average number of words was 12 (range 5-25) during the first observation, the second observation the average was 24 (range 8-45), and the third observation the average was 40 (range 15-79). For the non-talkers, the first observation had an average of 1 (range 0-3), the second observation had an average of 2 (range 0-6), and the third observation had an average of 4 (range 0-6). During snack time, the talkers had an average of 8 (range 0-20), the average for the second observation was 18 (range 10-20), and the average of the third observation increased to 34 (range 13-69). The non-talkers demonstrated little to no progress. During the first observation the average was 2 (0-7), the second and third observations both indicated an average of 3 (0-8).

It was concluded that the participants identified as talkers, demonstrated a steady increase in their vocabulary skills, whereas the non-talkers showed very little to no vocabulary growth in the number of spontaneous words uttered. The overall study determined that children who are taught the PECS system generalize it across settings. Approximately 44% of children gained non-echolalic communication skills and had successful interactions across settings. One key observation was when a child was trained in one communicative function (i.e., requesting), they demonstrated an increase in another untrained communicative function (i.e., commenting). Although there were participants who did not acquire verbal skills during this study, they were able to expand their communicative functions and generalize skills across settings.

Tincani, Crozer, and Alazetta (2006) began their research by conducting a delayed multiple baseline design study to determine the effects of the PECS on manding (requesting) and speech development for students with autism. Upon completing their initial study, they conducted an ABAB design study due to one participant demonstrating spontaneous speech. The

second study was conducted to confirm a relationship between Phase 4 of PECS and speech development. The participants included three males between the ages of 9-11 years old, all who have been diagnosed with autism. The first study only had two participants, Damian and Bob, and the second study had two participants, Damian (from the first study) and Carl. Sessions and observations were conducted within a self-contained public school classroom for children with autism.

Two target behaviors, manding and speech, were identified prior to their research. Manding was split into two categories, independent and prompted. An independent mand was identified as when the participant exchanged a picture symbol without prompts. A prompted mand required a gesture or physical prompt for the participant to pick up the picture symbol and walk it to the communicative partner. Two categories of speech were also recorded. These included word vocalizations, which were when the participant clearly uttered the correct name of an item he was requesting, and vocal approximations were when the participant's utterance was not clearly naming the item. For example, the participant may have been manding a cookie and said "cook," "da," "kee," or any other approximation that clearly was not "cookie."

Before establishing a baseline, the researchers determined each an assessment to determine preferred or reinforcing items for each participant to be used during PECS training. The assessment began by completing a parent survey. From the survey the participants were presented with a variety of preferred items from the survey and ranked into order of preference. A baseline was then established to determine that each participant did not have manding skills to exchange a picture of the preferred item or say the word of the item (vocalizations).

Once a baseline was established, PECS training began. Speech was not prompted or reinforced until Phase 4, where the participant was taught to use a sentence strip. When the participant placed the sentence strip in the communicative partner's hand, they would wait 3-5 seconds for the participant to produce a word vocalization or approximation. If a vocalization occurred within 3-5 seconds, the participant was immediately given access to the item. If no speech occurred, the participant was given access to the item after 3-5 seconds. The last four sessions of the study focused on generalization of PECS skills into the classroom and its' use with the classroom teacher.

Results for independent manding indicated that Damian increased his skills from an average 10.3% during baseline to an average of 79.4% throughout Phases 1-4. He was able to maintain these skills throughout generalization with an average of 74.5%. Bob demonstrated 0% of independent mands during baseline, and was able to increase his average to 46.2% during Phase 1. He continued to increase his independent mands to an average of 60.8% during Phase 2. It was noted that Bob required more than twice the number of sessions to meet acquisition criteria than Damian; therefore, he was not able to learn any phases beyond Phase 2 before the study ended.

Results for speech showed that Bob was not able to demonstrate any measurable speech. Damian did not demonstrate any word vocalizations during the study. He did, however, demonstrate an average of 66% vocal approximations during baseline and increased his approximations to an average of 87.6% by the end of Phase 4. He was also able to generalize his vocal approximations and maintain average of 82.3%.

Due to Damian's increase in vocal approximations during Phase 4 of PECS, a second study was conducted to determine if the reinforcement delay of 3-5 seconds (implemented in Phase 4) had a relationship to speech development. Another participant, Carl, was used in this study to compare data with. Carl had some previous training with PECS, but did not have appropriate skills to functionally communicate with pictures. He was retaught Phases 1-3 of PECS before implementing Phase 4 of PECS.

The second study included two phases, Phase A and Phase B. Carl was then taught Phase 4 of PECS during Phase A, which provided no reinforcement for speech. During Phase B, the procedures were the same except the item was delivered after a 3-5 second delay. Each phase, Phase A then phase B, were implemented a second time to compare data and vocal approximations.

Results indicated that during Carl demonstrated an average of 3% vocal approximations during Phase A1 and increased his vocal approximations to an average of 83.3% during Phase B1. During Phase A2, he demonstrated an average of 2% and increased his vocal approximations to 80.5% during Phase B2. Carl's percentage of mands during each Phase A was an average of 78.5%, and an average of 79.4% during B phases. The researchers suggested that the reinforcement delay had little influence on independent mands.

Overall, it was determined that PECS helped increase each participant's manding skills and generalize those skills across settings. PECS also is beneficial for teaching basic communication skills to children with autism who may not have effective communication skills. It was noted that PECS is useful for promoting speech, even though it is not the main goal of AAC devices.

Yoder and Lieberman (2009) conducted a quantitative study to compare two social-communicative interventions, PECS and Responsive Education, and Prelinguistic Milieu Teaching (RPMT). The participants consisted of 36 children between the ages of 18 months and 60 months. The 33 participants had a diagnosis of autism and three had a pervasive developmental delay. The study was based on two conditions in which the participants were randomly assigned. Nineteen children were assigned to the PECS intervention and 17 children were assigned to RMPT. Therapy sessions occurred three times per week for 20 minutes over a period of 6 months..

To begin their research, four assessments were administered to each participant to establish a baseline. These assessments included: *The Early Social Communication Scales-Abridges* (ESCS-Abridged), the *ADOS*, *Mullen Expressive Language Standard Score*, and *Mullen Receptive Language Standard Score*. Upon establishing a baseline, the participants were randomly assigned a group (PECS or RPMT) and began therapy sessions.

Two interventionists provided therapy to the PECS group. This group did not receive treatment throughout their day; only during the 20 minute sessions three times per week. Parent involvement was introduced to promote the use of PECS outside of treatment sessions. During the RPMT treatment, there was a primary therapist who would provide treatment twice per week and another therapist provided treatment once a week. RMPT establishes a play routine that is highly motivating for the participant to focus on specific communication behaviors (e.g., gestures, eye contact, vocalizations, etc.). Parents were involved by using a variety of responsive play and communication strategies.

Upon completion of therapy, the participants were administered the same four assessments that they were given prior to therapy. These data were compared and concluded that participants receiving the PECS intervention showed an increase in the number of picture exchanges as compared to children receiving RMPT. It was also suggested that teaching an individual with autism to generalize picture exchanges may promote their ability to attend to an object and person to communicate.

### Summary

Throughout Chapter 2, I reviewed 11 studies that researched the effects of PECS for children with autism. Each study explained the benefits PECS had on improving communication, social skills, and/or behavioral issues for children with autism. Table 1 provides a summary of these studies, which are discussed in Chapter 3.

### Table 2

#### Summary of Chapter 2 Findings

AUTHOR	DESIGN	PARTICIPANTS	PROCEDURES	FINDINGS
Adams-Hill & Flores (2014)	Single-subject alternating treatment design	Five students ages 3-9 years old. Three students had autism and two had developmental delay	Baseline data were used to establish a starting phase of PECS, and then PECS was implemented using either traditional PECS or the iPad.	Teaching the picture exchange model may be more effect prior to introducing the iPad for effective progression of communication. Two participants demonstrated spontaneous speech.
Ali, MacFarland, & Umbreit (2011)	Multiple probe design	Four students ages 7-14 years old (three girls and one boy) with autism, visual impairments, and moderate cognitive disabilities	Baseline data was collected using a multiple baseline probe, individualized interventions were introduced, maintenance data collected, and generalization was conducted in every training and maintenance phase.	All participants learned skills for requesting and generalized skills to the classroom and maintained them after training.



Table 2 (continued)

AUTHOR	DESIGN	PARTICIPANTS	PROCEDURES	FINDINGS
Dogoe, Banda, & Lock (2010)	Single-subject multiple baseline design	Three preschoolers 3-5 years old who have autism	Baseline, intervention, generalization, and generalization across stimulus classes Training phase: two sessions of data each day for at least 10 min Generalization: data collected on percentage of correct responses of requesting	-All participants gained skills for requesting and generalized across settings. Two out of the three met criterion for generalization across class probes.
Ganz, Cook, Corbin-Newsome, Bourgeois, & Flores (2005)	Single case study	5 year old girl with severe autism	Reinforcer assessment, baseline, and four training phases of PECS	PECS alone did not provide effective means for communication and individualized modification was implemented, which the participant met criterion for effectively using PECS.
Ganz, Lund, & Simpson (2012)	Single case study	5 year old girl with autism	-Baseline and implementation of all six phases of PECS. - Implementation of the next phase was based on data collection and progress monitoring.	Increased vocabulary and functional communication skills in multiple areas of her life and challenging behavior decreased. PECS facilitated in an increase in requesting.
Kravitz, Kamps, Kemmerer, & Potucek (2002)	Multiple baseline design across settings	6 year old girl with autism	-Baseline 1 was obtained for spontaneous language and baseline 2 introduced the communication board. -Three settings were used (home, centers, journal)	-Increase in spontaneous speech (requesting and comments) -Intelligible verbalizations increased -Peer social interaction increased
Lerna, Esposito, Conson, Russo, & Massagli (2012)	Quantitative	18 preschool children ages 18-60 months old. All participants had little or no functional language.	Two conditions: PECS and Conventional Language Therapy (CLT) were delivered 3x/week for 30 min. for 6 months	Pre-treatment: Groups did not differ Post-test: PECS showed significant improvement and can improve social communicative skills for children with autism

Table 2 (continued)

AUTHOR	DESIGN	PARTICIPANTS	PROCEDURES	FINDINGS
Lerna, Esposito, Conson, & Massagli (2014)	Quantitative	14 children with autism from a study conducted at an institute for diagnosis and rehabilitation of developmental disorders in Italy	Two conditions: PECS training and Conventional Language Therapy (CLT) were implemented based on the TEACCH methodology -Assessed three times (baseline, after 6 months of intervention, and 1 year after treatment completion)	PECS had higher duration of cooperative play and frequency of joint attention and initiation. It helped to encourage social-communicative skills.
Schwartz, Garfinkle, & Bauer (1998)	2 studies: 1-Months to acquire PECS 2-Generalization of PECS	Study 1: 31 children ages 3-6 (16 children with autism and 15 with developmental disabilities) Study 2: 18 children from study 1	Study 1: PECS was implemented and data were collected through IEP data. Study 2: Data collected for 12 months during snack and free-choice activities using language samples.	Study 1: Acquisition took an average of 14 months and children with severe comm. delays can learn PECS quickly. Study 2: PECS generalizes to untrained settings and has related effects on untrained language functions.
Tincani, Crozier, & Alazetta (2006)	2 studies: 1-Delayed multiple baseline design 2-ABAB design	3 males with autism between ages 9-11 at a public school	Study 1: A delayed multiple baseline design was used to evaluate the effects of PECS. Manding and speech were evaluated. Study 2: Conducted to confirm increased speech production using ABAB design.	Overall, PECS increased independent and spontaneous manding (requesting) and generalized manding to the classroom. Study 1: One child demonstrated measurable speech Study 2: Increased speech
Yoder & Lieberman (2009)	Quantitative	36 children between ages 18 and 60 months -33 had autism -3 had pervasive developmental disorder	Two conditions, randomly assigned: -19 children assigned PECS -17 children assigned Responsive Education and Pragmatic Milieu Training (RMPT)	PECS increased the number of exchanges than RMPT. PECS can facilitate generalized picture exchanges in three ways: between people, modes of communication (gestures, words, etc.), and settings. PECS promotes peer social communication skills.

### **Chapter 3: Conclusions and Recommendations**

Children with ASD often have a variety of social-communication deficits or delays, which can lead to the inability to communicate functionally. The implementation of the PECS is widely used to increase social-communication skills. The purpose of this starred paper was to determine the effectiveness of PECS for children with autism. Chapter 1 explained the importance of communication and provided background information about PECS, and Chapter 2 summarized the findings of 11 research studies that explained the effectiveness of PECS. In this chapter, I discuss the conclusions I made based on the studies I examined and recommendations for future research.

#### **Conclusions**

Each of the 11 studies that I examined determined that PECS showed improvements in every participant's communication skills. All of the studies demonstrated benefits for using PECS and determined that PECS is a useful tool for children with autism. There were a variety of designs used, which was beneficial for comparing and contrasting individual and group implementation, a variety of settings, and compared against different AAC programs.

The findings of each study pointed out the main benefits and improvements each participant made after PECS was implemented. I would like to note that since PECS is a program that is built upon mastering a series of skills/phases, each phase must meet specific criterion to move onto the next phase. As explained in Chapter 1, in the background information section, requesting, generalization, and commenting are skills that are taught in specific phases of PECS. Therefore, each study taught these skills. Each participant may or may not have mastered each phase; however, they showed an increase in communication skills due to the

implementation of PECS. Altogether, the studies noted positive effects on challenging behaviors, requesting/manding, generalization, vocabulary, maintenance, and social communication skills (i.e., peer social interactions, joint attention, initiations, and cooperative play). PECS even had positive effects on the production of spontaneous speech.

One study indicated a notable decrease in challenging behavior (Ganz et al., 2012). Ganz et al. indicated that PECS provides individuals without functional communication a way to communicate their needs. The participant was able to express her needs for a break, which decreased her challenging behaviors. Her mode of communication was more socially acceptable.

Six studies explained the effects on the participants ability to make requests (Ali et al., 2011; Dogoe et al., 2010; Ganz et al., 2012; Kravitz et al., 2002; Tincanti et al., 2006; Yoder & Lieberman, 2009). Each participant included in these studies was able to either gain the ability to make a request (Ali et al., 2011; Dogoe et al., 2010) or increase their requesting skills through the use of PECS (Ganz et al., 2012; Kravitz et al., 2002; Tincanti et al., 2006; Yoder and Lieberman, 2009).

Five studies noted the effects PECS had on generalization of skills to various settings and people (Ali et al., 2011; Dogoe et al., 2010; Schwartz et al., 1998; Tincanti et al., 2006; Yoder & Lieberman, 2009). One study noted that PECS increased generalization skills to untrained settings (Schwartz et al., 1998).

PECS is an alternative communication device; therefore, the participants in each study demonstrated an increase in some form of communication skills. However, five studies either focused their research on specific social-communicative functions or discovered notable increases in social-communicative functions or skills (Kravitz et al., 2002; Lerna et al., 2012;

Lerna et al., 2014; Schwartz et al., 1998; Yoder & Lieberman, 2009). Kravitz et al. (2002) found that using PECS assisted with peer-social interactions. Lerna et al. (2012) discovered that PECS showed significant improvements in social communication skills for children with autism. Further research concluded that Lerna et al. (2014) found that PECS increased participants' cooperative play, joint attention, and increased initiations. Schwartz et al. (1998) found that PECS has positive effects on untrained language functions. Yoder and Lieberman (2009) found that PECS increases the use modes of communication (i.e., gestures, words, etc.) and promotes peer social-communication skills.

Three studies discovered that PECS promoted spontaneous speech (Adams-Hill & Flores, 2014; Kravitz et al., 2002; Tincanti et al., 2006). One study concluded that the use of physical pictures promoted speech as compared to using a device that speaks for the individual (i.e., iPad). One study also indicated an increase in the participant's vocabulary (Ganz et al., 2012). Her vocabulary increase was noted in several areas of life (i.e., home, school, etc.).

Two studies discussed the participants' ability to maintain their skills after the initial implementation of PECS (Ali et al., 2011; Schwartz et al., 1998). Both studies described positive effects PECS had on the participants' lives by decreasing challenging behavior (Ali et al., 2011) and using PECS in untrained settings (Schwartz et al., 1998). Two studies conducted research after the initial implementation of PECS to determine the long-term effects PECS had compared to other programs, which found that PECS provided greater benefits than the other programs (Lerna et al., 2014; Yoder & Lieberman, 2009).

## **Recommendations for Future Research**

Throughout my analysis on the effects of PECS for children with autism, most of the studies I found provided data that showed the immediate benefits for using this type of AAC device. The studies were also limited to very few participants or just one participant. Much of the research was conducted in controlled environments with few communicative partners and in limited settings.

One of the main types of data I was hoping to find was the effects of PECS had on children with autism years after initial implementation. Future research needs to continue to follow-up with the participants included in these studies to determine long-term effects and benefits for using PECS. Of the 11 studies I found, only two studies conducted research on the long-term effects; however, this research was only conducted one year after implementation. Most of the studies addressed this need for additional follow-up research to conclude their findings to be beneficial for long-term use.

Future studies should also include a larger group of participants. Since the autism spectrum is very broad, it would be beneficial to compare a larger group of participants to one another to determine the effects PECS has on communication skills. Broadening future research to include more participants would be useful to determine long-term effects years after initial implementation.

Most of the students I work with, whom are non-verbal, use a form of an electronic communication device. All of the studies, except one, used physical pictures to implement PECS. The study that compared the use of an iPad with speech software to PECS determined that PECS showed more benefits. With the expansion of electronic devices, future research

should include more comparisons to devices such as the *Dynavox*, iPad, *GoTalk*, etc. These devices are easier to transport and can hold thousands of images and pages. Additional research comparing these devices to PECS is imperative to develop long-term effects on communication.

Future research should examine the use of PECS with a variety of communicative partners. The studies were limited to mainly adults who were close to the participant, which included the observer or researcher, teachers, and parents. One study included peers within the classroom. All communicative partners were familiar to the participants. Future research should be conducted to determine the effectiveness of PECS with unfamiliar people and environments. Settings and people in our lives are changing, so it is important to provide individuals with an effective way to communicate with anyone in any given place.

### **Implications for Practice**

It is important for teachers and educators to implement programs that are research-based and are proven to show benefits for students. Teachers should research the curriculum and tools they use to ensure they are providing the best for their students. There are many resources available to teachers, especially through the internet, that are widely used. However, some of the tools that are used aren't research based and provide no real evidence of benefits for students.

I was pleased to find, through my research, that PECS shows many benefits for children with autism. Since this program is widely used and very popular among special education teachers, it is comforting to know that this program is a positive research based intervention. I know that I can use this program throughout my teaching to provide my students a way to communicate.

To continue my research on the benefits of PECS, I would like to continue my research by comparing it to the Treatment and Education of Autistic and Communication related handicapped CHildren (TEACCH) program. This program was highly used by my cooperating teacher during my student teaching experience and has shown many benefits for children with autism. I have found that either PECS or TEACCH is preferred by teachers, usually not both. Therefore, it would be important to delve deeper into the benefits of PECS compared to other programs.

### **Summary**

Many children with autism spectrum disorders lack functional communication skills. When there are breakdowns in these skills, challenging behaviors can occur due to the inability to communicate their wants and needs. As teachers, it is important to use and implement programs that are research-based and are proven to increase wanted behaviors and skills. Providing individuals, who lack basic communication skills, with a means of communication allows them to share thoughts, ideas, and needs with one another (Ostry et al., 2008) and develop meaningful relationships (Ali et al., 2011).



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